

WHAT IS CLAIMED IS:

1 1. A woven fibrous article adapted to generate heat upon application of electrical
2 power, comprising:

3 a woven fibrous body comprised of a set of non-conductive warp yarns and a set of
4 non-conductive filling or weft yarns,

5 one of said set of non-conductive warp yarns and said set of non-conductive filling or
6 weft yarns in one or more first regions comprising relatively more coarse yarns and in one or
7 more second regions comprising relatively more fine yarns with electrical conductor
8 elements extending generally along said second regions of said woven fibrous body and
9 adapted to connect a plurality of spaced apart electrical conductance heating elements in a
10 parallel electrical circuit to a source of electrical power, and

11 the other of said set of non-conductive warp yarns and said set of non-conductive
12 filling or weft yarns in the one or more first regions and in the one or more second regions
13 comprising relatively more fine yarns, with said plurality of spaced apart electrical
14 conductance heating elements in the form of conductive elements joined in said woven
15 fibrous body with the other of said set of non-conductive warp yarns and said set of non-
16 conductive filling or weft yarns to extend generally between opposite said second regions of
17 said woven fibrous body.

1 2. The woven fibrous article of claim 1, where said woven fibrous article further
2 comprises fleece upon at least one surface of said woven fibrous body, formed by finishing
3 fibers of the relatively more coarse yarns in said one or more first regions of said one of said
4 set of non-conductive warp yarns and said set of non-conductive filling or weft yarns in a
5 manner to avoid damage to electrical conductivity performance of the conductive elements
6 joined with the other of said set of non-conductive warp yarns and said set of non-conductive
7 filling or weft yarns of said woven fibrous body.

1 3. The woven fibrous article of claim 2, wherein said woven fibrous body has fleece
2 formed in said relatively more coarse non-conductive fibers upon both surfaces.

1 4. The woven fibrous article of claim 1, wherein, in said one or more first regions,
2 said set of non-conducting warp yarns comprises said relatively more coarse yarns and said
3 set of non-conducting filling or weft yarns comprises said relatively more fine yarns.

1 5. The woven fibrous article of claim 4, wherein said one or more second regions
2 comprises selvedge or edge regions.

1 6. The woven fibrous article of claim 1, wherein, in said one or more first regions,
2 said set of non-conducting filling or weft yarns comprises said relatively more coarse yarns
3 and said set of non-conducting warp yarns comprises said relatively more fine yarns.

1 7. The woven fibrous article of claim 6, wherein said one or more second regions
2 comprises spaced regions with one or more said first regions disposed therebetween.

1 8. The woven fibrous article of claim 6 or claim 7, wherein said one or more second
2 regions comprises a plurality of spaced second regions with one or more said first regions
3 disposed therebetween.

1 9. The woven fibrous article of claim 1, claim 4 or claim 6, wherein a series of at least
2 three electrical conductance heating elements of said plurality of electrical conductance
3 heating elements are symmetrically spaced.

1 10. The woven fibrous article of claim 9, wherein selected of said electrical
2 conductance heating elements are asymmetrically spaced to provide selected localized
3 regions of heating.

1 11. The woven fibrous article of claim 1, claim 4 or claim 6, wherein selected of said
2 electrical conductance heating elements are asymmetrically spaced to provide selected
3 localized regions of heating.

1 12. The woven fibrous article of claim 1, claim 4 or claim 6, wherein selected of said
2 conductive elements have relatively lower linear resistance than other of said conductive
3 elements, to provide selected localized regions of relatively greater heating.

1 13. The woven fibrous article of claim 12, wherein said selected of said conductive
2 elements of relatively lower linear resistance are symmetrically spaced.

1 14. The woven fibrous article of claim 13, wherein said selected of said conductive
2 elements of relatively lower linear resistance are asymmetrically spaced.

1 15. The woven fibrous article of claim 1, wherein said conductive elements have the
2 form of a conductive yarn.

1 16. The woven fibrous article of claim 1, wherein said fibrous body comprises
2 hydrophilic material.

1 17. The woven fibrous article of claim 1, wherein said fibrous body comprises
2 hydrophobic material.

1 18. The woven fibrous article of claim 1, wherein said electrical conductor elements
2 are adapted for connecting said plurality of spaced-apart electrical conductance heating
3 elements in the parallel electrical circuit to a power source of alternating current.

1 19. The woven fibrous article of claim 1, wherein said electrical conductor elements
2 are adapted for connecting said plurality of spaced-apart electrical conductance heating
3 elements in the parallel electrical circuit to a power source of direct current.

1 20. The woven fibrous article of claim 19, wherein said power source of direct current
2 comprises a battery.

1 21. The woven fibrous article of claim 20, wherein said battery is mounted to said
2 woven fibrous body.

1 22. The woven fibrous article of claim 1, wherein said woven fibrous article further
2 comprises a power source connected to said plurality of spaced apart electrical conductance
3 heating elements by said electrical conductor elements, said power source comprising a
4 battery mounted to said woven fibrous body.

1 23. The woven fibrous article of claim 1, wherein said electrical conductor elements
2 are woven into said second regions of said woven fibrous body.

1 24. The woven fibrous article of claim 4, wherein said electrical conductor elements
2 are woven into said second regions of said woven fibrous body with said non-conductive
3 warp yarns.

1 25. The woven fibrous article of claim 6, wherein said electrical conductor elements
2 are incorporated into said second regions of said woven fibrous body with said non-
3 conductive filling or weft yarns.

1 26. The woven fibrous article of claim 23, claim 24 or claim 25, wherein said
2 electrical conductor elements comprise at least two yarns.

1 27. The woven fibrous article of claim 1, wherein said electrical conductor elements,
2 at least in part, are applied as a conductive paste.

1 28. The woven fibrous article of claim 1, wherein said electrical conductor elements
2 comprise a conductive wire.

1 29. The woven fibrous article of claim 1, wherein said electrical conductor elements,
2 at least in part, are applied as a conductive hot melt adhesive.

1 30. The woven fibrous article of claim 1, wherein said electrical conductor elements
2 comprise a conductive yarn or a conductive thread.

1 31. The woven fibrous article of claim 1, wherein said electrical conductor elements
2 are attached upon a surface in a said second region of said woven fibrous body.

1 32. The woven fibrous article of claim 31, wherein said electrical conductor elements
2 are attached by stitching.

1 33. The woven fibrous article of claim 32, wherein said stitching comprises
2 embroidery stitching.

1 34. The woven fibrous article of claim 31, wherein said electrical conductor elements
2 are attached by sewing.

1 35. The woven fibrous article of claim 31, wherein said electrical conductor elements
2 are attached by adhesive.

1 36. The woven fibrous article of claim 31, wherein said electrical conductor elements
2 are attached by laminating.

1 37. The woven fibrous article of claim 31, wherein said electrical conductor elements
2 are attached by mechanical fastening.

1 38. The woven fibrous article of claim 31, wherein said electrical conductor elements
2 are attached by strain relief fastening.

1 39. The woven fibrous article of claim 1, wherein said electrical conductance heating
2 element has the form of a conductive yarn comprising a core, an electrical conductance
3 heating filament, and a sheath material wrapped about said core.

1 40. The woven fibrous article of claim 39, wherein said core comprises said electrical
2 conductance heating element and said sheath comprises insulating material.

1 41. The woven fibrous article of claim 39, wherein said core comprises insulating
2 material and said sheath wrapped about said core comprises said electrical conductance
3 heating element.

1 42. The woven fibrous article of claim 41, wherein said electrical conductance
2 heating element further comprises an overwrap comprising insulating material wrapped about
3 said core and said sheath.

1 43. The woven fibrous article of claim 1, wherein said electrical conductance heating
2 element has the form of a conductive yarn comprising an electrical conductance heating
3 filament.

1 44. The woven fibrous article of claim 39, claim 40, claim 41, claim 42, or claim 43,
2 wherein said electrical conductance heating element has electrical resistivity in the range of
3 about 0.1 ohm/cm to about 500 ohm/cm.

1 45. A woven fibrous article adapted to generate heat upon application of electrical
2 power, formed by a method comprising the steps of:

3 joining a set of non-conductive warp yarns and a set of non-conductive filling or weft
4 yarns to form a woven fibrous body, one of the set of non-conductive warp yarns and the set
5 of non-conductive filling or weft yarns in one or more first regions comprising relatively
6 more coarse yarns and in one or more second regions comprising relatively more fine yarns
7 and the other of the set of non-conductive warp yarns and the set of non-conductive filling or
8 weft yarns in the one or more first regions and in the one or more second regions comprising
9 relatively more fine yarns,

10 joining, in the woven fibrous body, with the other of the set of non-conductive warp
11 yarns and the set of non-conductive filling or weft yarns, the plurality of spaced apart
12 electrical conductance heating elements in the form of conductive elements, to extend
13 generally between opposite second regions of the woven fibrous body, and

14 connecting the plurality of spaced apart electrical conductance heating elements to
15 electrical conductor elements extending generally along the second regions of the woven

1 46. The method of forming the fibrous article of claim 45, said method further
2 comprising the step of:

3 finishing relatively more coarse yarns fibers in the one or more first regions of the set
4 of the non-conductive warp yarns and the set of non-conductive filling or weft yarns in a
5 manner to avoid damage to electrical conductivity performance of the conductive elements
6 joined with the other of the set of non-conductive warp yarns and the set of non-conductive
7 filling or weft yarns of the woven fibrous body.

1 47. A method of forming a woven fibrous article adapted to generate heat upon
2 application of electrical power, said method comprising the steps of:

3 joining a set of non-conductive warp yarns and a set of non-conductive filling or weft
4 yarns to form a woven fibrous body, one of the set of non-conductive warp yarns and the set
5 of non-conductive filling or weft yarns in one or more first regions comprising relatively
6 more coarse yarns and in one or more second regions comprising relatively more fine yarns
7 and the other of the set of non-conductive warp yarns and the set of non-conductive filling or
8 weft yarns in the one or more first regions and in the one or more second regions comprising
9 relatively more fine yarns,

10 joining, in the woven fibrous body, with the other of the set of non-conductive warp
11 yarns and the set of non-conductive filling or weft yarns, the plurality of spaced apart
12 electrical conductance heating elements in the form of conductive elements, to extend
13 generally between opposite second regions of the woven fibrous body, and

14 connecting the plurality of spaced apart electrical conductance heating elements to
15 electrical conductor elements extending generally along the second regions of the woven
16 fibrous body to form a parallel electrical circuit for connection to a source of electrical
17 power.

1 48. The method of claim 47, further comprising the steps of:

2 finishing relatively more coarse yarns fibers in the one or more first regions of the set
3 of the non-conductive warp yarns and the set of non-conductive filling or weft yarns in a
4 manner to avoid damage to electrical conductivity performance of the conductive elements

5 joined with the other of the set of non-conductive warp yarns and the set of non-conductive
6 filling or weft yarns of the woven fibrous body.

1 49. The method of claim 47 further comprising the step of connecting the conductive
2 element to a source of electric power and generating heat.

1 50. The method of claim 49 further comprising the step of connecting the conductive
2 element to a source of electric power comprising alternating current and generating heat.

1 51. The method of claim 49 further comprising the step of connecting the conductive
2 element to a source of electric power comprising direct current and generating heat.

1 52. The method of claim 51 further comprising the step of connecting the conductive
2 element to a source of electric power comprising direct current in the form of a battery and
3 generating heat.

1 53. The method of claim 52 further comprising the step of connecting the conductive
2 element to a source of electric power comprising direct current in the form of a battery
3 mounted to the woven fibrous article and generating heat.

1 54. The method of claim 47 further comprising the step of rendering elements of said
2 woven fibrous body hydrophilic.

1 55. The method of claim 47 further comprising the step of rendering elements of said
2 woven fibrous body hydrophobic.